

WHAT IS CLAIMED IS:

1. A gate valve apparatus comprising:  
a valve body having a rectilinear exhaust flow path formed therein to extend from a chamber port to a pump port; and  
a main valve provided in said valve body, said main valve including a main valve element and a main valve seat, said main valve element being movable within a travel space in a direction parallel to an axis of said exhaust flow path, so that when said main valve element is in a sealing position, a main valve seal for said main valve element contacts said main valve seat to block communication through said exhaust flow path, and when it is in a non-sealing position, said main valve element is separated from said main valve seat by a predetermined distance and moved in a direction perpendicular to the axis of said exhaust flow path so as to be accommodated in an accommodating chamber;  
wherein said main valve seal is provided on an abutting surface of said main valve element, and an annular projection is provided on an inner wall surface of said accommodating chamber, so that when it is in the non-sealing position, said main valve element is moved toward the inner wall surface of said accommodating chamber to bring an outer peripheral portion of said main valve element into contact with said annular projection, whereby said main valve seal is shielded from radicals and plasma in exhaust gas by said main valve element, said annular

projection and the inner wall surface of said accommodating chamber.

2. A gate valve apparatus according to claim 1, wherein either one of annular groove and an annular cut portion is formed on an outer peripheral portion of the abutting surface of said main valve element radially outward of said main valve seal, so that said annular projection is fitted into said annular groove or annular cut portion when said main valve seal is in the shielded position.

3. A gate valve apparatus according to claim 1, wherein when said main valve seal is in the shielded position, an outer peripheral surface of said main valve element is fitted to an inner peripheral surface of said annular projection.

4. A gate valve apparatus according to claim 1, wherein when said main valve seal is in the shielded position, an outer peripheral portion of the abutting surface of said main valve element that is radially outward of said main valve seal is abutted against said annular projection.

5. A gate valve apparatus comprising:  
a valve body having a rectilinear exhaust flow path formed therein to extend from a chamber port to a pump port; and

a main valve provided in said valve body, said main valve including a main valve element and a main valve seat, said main valve element being movable within a travel

space in a direction parallel to an axis of said exhaust flow path, so that when said main valve element is in a sealing position, a main valve seal for said main valve element contacts said main valve seat to block 5 communication through said exhaust flow path, and when it is in a non-sealing position, said main valve element is separated from said main valve seat by a predetermined distance and moved in a direction perpendicular to the axis of said exhaust flow path so as to be accommodated in 10 an accommodating chamber;

wherein said main valve seal is provided on an abutting surface of said main valve element, and a shielding ring is secured to an outer peripheral portion of the abutting surface of said main valve element that is 15 radially outward of said main valve seal, and further an annular groove is formed on said main valve seat, so that when said main valve element is in the sealing position, said shielding ring is positioned in said annular groove, and said main valve seal contacts said main valve seat, 20 and when it is in the non-sealing position, said main valve element is separated from said main valve seat by a predetermined distance and moved toward an inner wall surface of said accommodating chamber to bring said shielding ring into contact with the inner wall surface of 25 said accommodating chamber, whereby said main valve seal is shielded from radicals and plasma in exhaust gas by said main valve element, said shielding ring and the inner wall surface of said accommodating chamber.

6. A gate valve apparatus according to claim 1,  
further comprising:

a plurality of rotary resistance valve elements  
having slats on respective rotating shafts that are  
5 rotatably provided in said exhaust flow path to extend in  
a direction perpendicular to the axis of said exhaust flow  
path, so that a flow rate through said exhaust flow path  
is controlled by varying an angle of the slats of said  
rotary resistance valve elements.

10 7. A gate valve apparatus according to claim 6,  
wherein said rotating shafts are disposed parallel to each  
other, and a plurality of pinions are each secured to one  
end of each of said rotating shafts, said pinions being  
meshed with a compound rack, some of said pinions being  
15 meshed at one side thereof with said compound rack, and  
the rest of said pinions being meshed at the other side  
thereof with said compound rack, so that said some of said  
pinions and the rest of said pinions rotate in opposite  
directions to each other in response to a reciprocating  
20 motion of said compound rack.

8. A gate valve apparatus according to claim 1,  
further comprising:

a slide resistance valve element provided in said  
travel space at a predetermined distance from said main  
25 valve element, said slide resistance valve element being  
movable in a direction perpendicular to the axis of said  
exhaust flow path, so that a flow rate through said  
exhaust flow path is controlled by movement of said slide

resistance valve element in the direction perpendicular to the axis of said exhaust flow path.

9. A gate valve apparatus according to claim 6 or 7, wherein a heater is installed near the pinions of said 5 rotating shafts to prevent adhesion of a by-product to the slats of said rotary resistance valve elements.

10. A gate valve apparatus according to claim 7, wherein the reciprocating motion of said compound rack is performed by a cylinder device using a metal bellows.

10 11. A gate valve apparatus according to claim 8, wherein a metal bellows is used as an actuator for moving said slide resistance valve element in the direction perpendicular to the axis of said exhaust flow path.

12. A gate valve apparatus comprising:

15 a valve body having a rectilinear exhaust flow path formed therein to extend from a chamber port to a pump port; and

20 a main valve provided in said valve body, said main valve including a main valve element and a main valve seat, said main valve element being movable within a travel space in a direction parallel to an axis of said exhaust flow path, so that when said main valve element is in a sealing position, a main valve seal for said main valve element contacts said main valve seat to block 25 communication through said exhaust flow path, and when it is in a non-sealing position, said main valve element is separated from said main valve seat by a predetermined distance and moved in a direction perpendicular to the

axis of said exhaust flow path so as to be accommodated in an accommodating chamber;

wherein said main valve seal is provided on an abutting surface of said main valve element, and when it 5 is in the non-sealing position, said main valve element is moved toward an inner wall surface of said accommodating chamber and further moved in a direction parallel to the axis of said exhaust flow path so as to be pressed against the inner wall surface of said accommodating chamber, 10 whereby a pressing surface of said main valve element is shielded from plasma.